PTO 08-1220

CC = WO
19960310
A1
9630058

APPARATUS FOR CLEANING AND/OR DISINFECTING SURGICAL INSTRUMENTS
[Gerät zum Reinigen und/oder Desinfizieren von chirurgischen Instrumenten]

Karl Schad

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. DECEMBER 2007
TRANSLATED BY: THE MCELROY TRANSLATION COMPANY

PUBLICATION COUNTRY	(19):	DE
DOCUMENT NUMBER	(11):	9630058
DOCUMENT KIND	(12):	A1
PUBLICATION DATE	(43):	19960310
APPLICATION NUMBER	(21):	PCT/EP96/01333
APPLICATION DATE	(22):	19960327
INTERNATIONAL CLASSIFICATION[6]	(51):	A 61 L 2/06
PRIORITY COUNTRY	(33):	Germany
PRIORITY NUMBER	(31):	195 11 037.4
PRIORITY DATE	(32):	March 28, 1995
INVENTOR	(72):	Karl Schad
APPLICANT	(71):	Karl Schad
DESIGNATED CONTRACTING STATES	(81):	AU, BR, CA, CN, JP, KR, MX, NO, NZ, US, European Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
TITLE	(54):	APPARATUS FOR CLEANING AND/OR DISINFECTING SURGICAL INSTRUMENTS
FOREIGN TITLE	[54A]:	Gerät zum Reinigen und/oder Desinfizieren von chirurgischen Instrumenten

The present invention relates to an apparatus for cleaning and/or disinfecting surgical instruments /1* and to a method in which this apparatus can be used.

Surgical instruments are known in many shapes and designs and are commercially available. Today's problems are mainly due to the more stringent hygiene requirements. It is known that diseases are transmitted by unclean instruments, which is completely undesirable, especially in view of the risk of transmitting hepatitis and AIDS. It is therefore necessary today to clean surgical instruments extremely thoroughly. This is especially true in cases in which such instruments consist of many individual parts that are contaminated when such an instrument is used. In addition, such parts are in most cases located in areas that are very difficult to access so that simply rinsing the instrument with a disinfecting liquid or the like is not sufficient. It must be absolutely ensured that any bacteria, viruses and other organisms or /2 pathogens are killed.

This applies especially to instruments that are inserted into the body of a patient. Such instruments include, for example, biopsy forceps, instruments for use in minimal invasive surgery, arthroscopy, endoscopy, etc. The list could be continued at length.

Thus, the problem to be solved by the present invention is to make available an apparatus and a method of the type mentioned above which meet these highly stringent hygiene requirements.

To solve this problem, the surgical instrument is placed into a cleaning chamber in which at least one nozzle for applying hot steam and/or hot air to it is dedicated to said instruments. Preferably, two nozzles are provided.

Bacteria, viruses and other pathogens are able to survive only at a certain temperature. If this temperature is changed, the bacteria, viruses and other pathogens are killed. This means that the transmission of disease is substantially prevented. The use of hot steam and/or hot air has the advantage

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* [Numbers in right margin indicate pagination of the original text.]

that both of these media are able to deeply penetrate into a surgical instrument and, in particular, are also able to reach areas which are in most cases not accessible to a cleaning liquid. In addition, the action of hot steam and/or air also heats the metal of the surgical instrument, if said instrument is made of metal as is generally the case at least as far as the jaws of the instrument are concerned, so that this heat is also transmitted to inaccessible areas where the pathogens can be destroyed as well.

To generate steam or hot dry air, a heating device should be disposed upstream of the nozzles. As a /3
rule, it is possible to fill both water and air into a reservoir and to heat said reservoir. Steam and/or hot air can subsequently be withdrawn from the relevant reservoir on demand. It is also possible to provide for a connection to an external water system.

The withdrawal of hot steam and/or hot air is controlled by means of a valve means which, together with the other operating elements, is disposed inside an operating chamber, with this chamber being separated from the cleaning chamber by a central partition wall. In this manner, a single unit is made available, which unit can be easily transported and handled.

Cleaning and/or disinfecting the surgical instrument can be additionally improved in that it is possible to rotate the instrument relative to the nozzles or the nozzles relative to the instrument. In this manner, the steam or dry air is able reach any area of the surgical instrument. One practical example of a simple rotating device comprises a rotary disk in which the surgical instrument is seated. The surgical instrument can optionally also be surrounded by a holder, which allows the rotary disk to be adapted to surgical instruments of different shapes.

The rotary disk is subsequently connected to a drive. The drive, by way of a gear wheel, transmits a rotary movement to external gear teeth of the rotary disk. Many embodiments are conceivable, all of which fall within the scope of the invention.

In an improved embodiment of the invention, the apparatus as well as the method according to the present invention are designed for use with instruments that have at least one tubular shaft on which a /4
jaw is disposed. In this case, it is important that this tubular shaft be subjected to a special cleaning and disinfecting cycle since such a shaft is especially likely to allow the penetration of tissue fluid, blood, etc. Instruments of this type include, for example, the biopsy forceps described above, etc.

In this case, according to the present invention, hot steam is applied to the jaw which is subsequently dried at a later time. However, to clean and disinfect the inside of the tubular shaft as well as the internal articulated parts of the jaw, etc., the tubular shaft should be connected via a tube to a tank for disinfecting liquid. This allows the tubular shaft to subsequently be rinsed with disinfecting liquid.

The connection between the tube and the disinfection tank is preferably also implemented by the valve means described above so as to allow making a switch on demand. At the same time, it is also possible to flush the tube--which, for example, may be part of the surgical instrument--with water at a pressure of approximately 8 bar before rinsing said tube with the disinfecting liquid. After disinfection with the disinfecting liquid, the disinfecting liquid is purged, preferably by means of hot air.

Since pressure is exerted on the media in the apparatus according to the present invention, such as water, steam or air or disinfecting liquid, one or more pumps are integrated into the operating part of the apparatus. This pump or these pumps is/are also connected to the valve means so that it/they can be actuated on demand.

The apparatus according to the present invention makes it possible to clean and disinfect surgical instruments automatically, more easily and more effectively. The apparatus operates by using programs, /5
similar to those of a dishwasher, depending on the surgical instrument used and the cleaning and disinfection requirements. /6

Additional advantages, features and details of the invention result from the following description of preferred practical examples and from the drawings; as can be seen:

Figure 1 shows a diagrammatic front elevation of an apparatus according to the present invention for cleaning and disinfecting surgical instruments, and

Figure 2 shows a cross section through an element of the apparatus seen in Figure 1 along line II-II.

An apparatus R according to the present invention for cleaning and disinfecting surgical instruments 1, in particular of biopsy forceps, comprises a housing 2. This housing 2 is divided by a central partition wall 3 into a cleaning chamber 4 and an operating chamber 5. The cleaning chamber 4 also includes a drip tray 6 for collecting condensed steam and/or disinfecting liquid.

The surgical instrument 1 has a jaw 7 disposed on a tubular shaft 8. This tubular shaft 8 is embedded in a holder 9, on the one hand, and on the other hand, has a flexible tube 10 which is coupled via a connector 11 to the operative chamber 5. The tube 10 can consist of any flexible material, for example, plastic. In some instruments, the tube 10 is an integral part of the surgical instrument 1, by means of which tube tissue specimens removed from the body are transported to a receiving container. Other surgical instruments have no such tube 10. In that case, the tube 10 is designed only as a connecting line between the surgical instrument 1 and the connector 11.

As seen in Figure 2, for the sake of simplicity, the holder 9 is made of two half shells 12 and 13, /7 each of which has a longitudinal groove 14 and 15, respectively, to receive the surgical instrument 1. The two half shells 12 and 13 are connected to each other by means of an articulated link 16. The longitudinal grooves 14 and 15 preferably are wedge-shaped so that they are able to receive surgical instruments 1 with tubular shafts of different diameters. In addition, it is also conceivable to line the longitudinal grooves 14 and 15 with an elastic material so as to ensure a better grip of the surgical instruments 1 with tubular shafts of different diameters.

When the instrument is used (see Figure 1), the holder 9 is inserted in a rotary disk 17 which is rotatably disposed on an outside wall 18 of the housing 2. The rotary disk 17 is connected to a drive 19 which is able rotate the rotary disk 17. For the sake of simplicity, a connection between the drive 19 and the rotary disk 17 is implemented by means of a gear wheel 20 which engages into external gear teeth in the rotary disk 17. In the present practical example, the drive 19 is located inside the cleaning chamber 4 and is therefore protected by a cover 21.

In the cleaning chamber 4, two nozzles 22.1 and 22.2 are dedicated to the surgical instrument 1 and, in particular, to the jaw 7, which nozzles are able to apply steam, disinfecting liquid and/or air to the jaw 7. These nozzles can be made to rotate by means (17.1,19.1,20.1) similar to those of the holder 9.

Inside the operating chamber 5, the nozzles 22 are connected to a valve means 23 which is only schematically sketched. A water tank 24, a tank 25 for a disinfecting liquid, a compressed air supply connection 26 to the outside or to an integrated air generator, and a pump 27 are also connected to this valve means 23. The valve means 23 can connect both the nozzles 22 and the connector 11 via tube 10 /8 to the surgical instrument 1, the water tank 24, the disinfection tank 25 or the compressed air supply connection 26. Inside the valve means 23, the necessary pressure is maintained via the pump 27.

The water tank 24 and the disinfection tank 25 are closed by means of suitable covers 28 and 29.

The present invention operates as follows:

For cleaning and disinfecting the surgical instrument 1, said instrument is inserted into the holder 9. The tubular shaft 8 is to be positioned in the longitudinal grooves 14 and 15. If the surgical instrument 1 does not have a flexible tube 10, it is connected at its rear end to the tube 10 of the apparatus R. In other cases, the tube 10 is affixed to the connector 11.

Next, the holder 9 is inserted into the rotary disk 17 in which the holder 9 is held in a form-fitting and/or friction-locked manner. For example, the rotary disk 17 can have a recess which is lined with a

rubber-like material. This rubber-like material encloses the holder 9 so tightly that the holder 9 can be turned relative to the rotary disk 17 only by the exertion of increased force.

When the instrument is in use, the jaw 7 of the surgical instrument 1 lies close to the nozzles 22. Next, through the nozzles, hot steam at a temperature of approximately 120°C is applied to the jaw 7. During this steam application, the surgical instrument 1 should be rotated. To this end, the drive 19 is actuated, which drive rotates the rotary disk 17 preferably twice to the right and subsequently twice to /9
the left. This causes steam to be applied to the jaw from all sides. Thus, the jaw and in particular the articulated hinge parts are effectively cleaned and disinfected.

The valve means 23 subsequently connects the disinfection tank 25 with the connector 11 so that the entire surgical instrument 1 can be rinsed and cleaned with disinfecting liquid via the tube 10.

After rinsing with disinfecting liquid, it is recommended that a certain time be allowed to elapse to ensure that the disinfecting liquid can act on all areas of the surgical instrument 1. The valve means 23 subsequently connects the connector 11 to the compressed air supply connection 26. Compressed air is used to purge the surgical instrument 1 through the tube 10 to ensure that no disinfecting liquid remains in the surgical instrument 1. Rinsing prior thereto with water is also possible.

Subsequently, the compressed air supply connection 26 is connected to the nozzles 22, with a heating device 30 heating the air in front of the nozzles 22. This means that the jaw 7 can now be dried by means of hot air. Again, it is possible to rotate the instrument 1 during this cycle.

It is self-evident that the entire cleaning and disinfecting process should preferably take place as fully automatically as possible, i.e., the apparatus R should comprise a suitable electronic circuit with an automatic control system. For the sake of clarity, this circuit has been omitted in the drawings.

Claims /10

1. An apparatus for cleaning and disinfecting surgical instruments (1), characterized in that the surgical instrument is placed into a cleaning chamber (4) where at least one, preferably two, nozzles (22.1, 22.2) for applying hot steam and/or hot air to the instrument is/are disposed.

2. The apparatus as claimed in Claim 1, characterized in that the nozzles (22.1, 22.2) are connected to a water tank (24) or a compressed air supply connection (26) via a heating device (30).

3. The apparatus as claimed in Claim 2, characterized in that a valve means (23) is disposed between the nozzle (22) and the water tank (24) and/or the compressed air supply connection (26).

4. The apparatus as claimed in Claim 2 or 3, characterized in that the heating device (30), the water tank (24), the compressed air supply connection (26) and possibly the valve means (23) are located in an operating chamber (5) which is separated from the cleaning chamber (4) by a central partition wall within a single housing (2).

5. The apparatus as claimed in at least one of Claim 1-4, characterized in that the surgical instrument (1) is connected to a rotating device (17,20,19).

6. The apparatus as claimed in Claim 5, characterized in that the surgical instrument (1) is supported in a holder (9) and that said holder is connected to the rotating device (17,20,19). /11

7. The apparatus as claimed in Claim 6, characterized in that the holder (9) comprises two half shells (12,13) that are connected to each other by means of an articulated hinge (16) and each of which has a longitudinal groove (14,15) for receiving the surgical instrument (1).

8. The apparatus as claimed in Claim 7, characterized in that the holder (9) is inserted into a rotating disk which is optionally connected to the drive (19) via a gear wheel (20).

9. The apparatus as claimed in at least one of Claims 1-8, characterized in that the surgical instrument (1) has a jaw (7) disposed on a tubular shaft (8) or the like, which tubular shaft can be connected to a connector (11) via a tube (10)

10. The apparatus as claimed in Claim 9, characterized in that the connector (11) can be connected to a disinfecting tank (25), the compressed air supply connection (26) (external or internal air generator) and optionally to the water tank (water system) (24).

11. The apparatus as claimed in Claim 10, characterized in that at least one pump (27) is dedicated to the valve means (23).

12. A method of cleaning and/or disinfecting surgical instruments, characterized in that hot steam and/or hot air is applied to the surgical instrument.

13. A method of cleaning and/or disinfecting surgical instruments having a jaw disposed on a tubular shaft, characterized in that hot steam is applied to the jaw, that the tubular shaft is rinsed with water /12
and/or disinfecting liquid and subsequently with water and/or air and/or is dried with hot air and that subsequently, hot dry air is applied to the jaw.

14. The method as claimed in Claim 12 or 13, characterized in that during the cleaning and/or disinfecting cycle, the surgical instrument and/or nozzles are rotated so as to apply steam to the surgical instrument and/or to the nozzles.

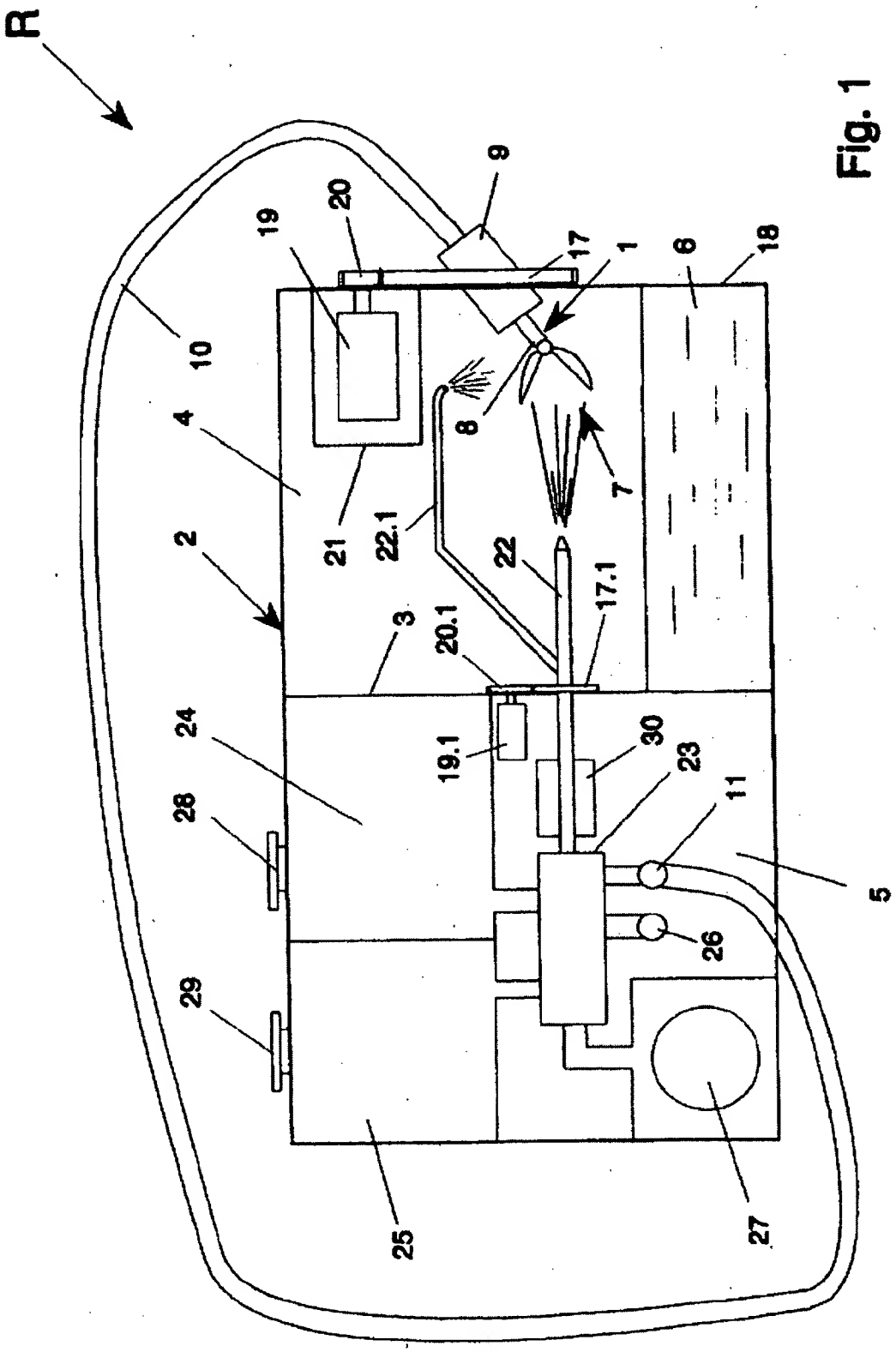
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Fig. 1

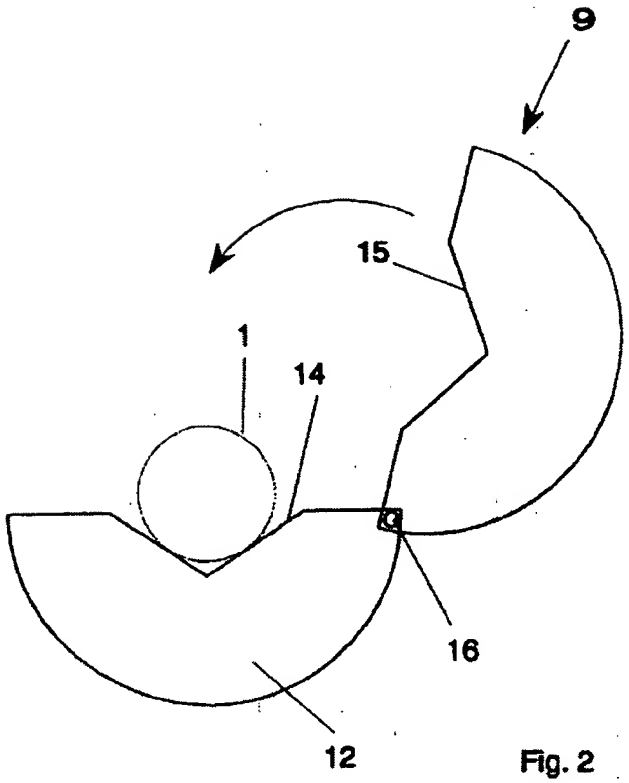

Fig. 2

INTERNATIONAL SEARCH REPORT

Int~ ~ational Application No
PCT/EP 96/01333

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61L2/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	DE 44 43 757 A (NOACK DIETER) 13 June 1996 see page 3, line 17 - line 22 see page 4, line 36 - line 41 see page 5, line 24 - line 50 see claims; example	1-6,12, 14
P,X	WO 95 14494 A (ELECTRICAL CONTROL SYSTEMS PTY ;LAWRENCE PETER DAVID (AU)) 1 June 1995 see claims	1,12
X	FR 1 600 886 A (W.LÖDIGE) 3 August 1970 see page 3, line 10 - page 4, line 8	1,12
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[X] Further documents are listed in the continuation of box C. [X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 September 1996	09.09.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+ 31-70) 340-3016	Cousins-Van Steen, G

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 96/01333

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 43 23 815 A (SIEMENS AG) 19 January 1995 see column 1, line 50 - column 2, line 1	1-14
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INTERNATIONAL SEARCH REPORT

nformation on patent family members

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		CA-A-	2177387	01-06-95
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